Western Kentucky University

Laboratory Safety and Chemical Hygiene Plan

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1. INTRODUCTION

It is the policy of Western Kentucky University (hereafter, WKU) to take every reasonable precaution to ensure laboratory workspaces are safe and free from recognizable hazards. The Laboratory Safety and Chemical Hygiene Plan is a written program for ensuring the safe use of chemicals in laboratories at WKU.

1.1 Purpose

The purpose of this Laboratory Safety and Chemical Hygiene Plan is to describe practices and procedures pertaining to working with or around any hazardous materials or chemicals within a university laboratory or classroom setting. This plan is to provide guidance for safe handling of all hazardous chemicals in laboratories; as well as, to ensure compliance with Occupational Safety and Health Administration (OSHA), Environmental Protection Agency (EPA), and local applicable regulations.

1.2 Regulatory Basis

The Chemical Hygiene Plan is part of WKU's compliance with the regulations promulgated on January 31, 1990 by the U.S. Department of Labor Occupational Safety and Health Administration (OSHA). This standard entitled "Occupational Exposures to Hazardous Chemicals in Laboratories", 29 CFR 1910.1450, is hereafter referred to as "The Laboratory Standard." The basis for this standard is a determination that laboratories differ from industrial operations in their use and handling of hazardous chemicals and that a different approach than that found in OSHA's substance specific health standards is warranted to protect workers. This standard does not establish new exposure limits; rather, it sets other performance provisions designed to protect laboratory workers from potential hazards in their work environment. The WKU Laboratory Safety and Chemical Hygiene Plan is established to meet or exceed the requirements outlined in The Laboratory Standard, where laboratory is defined as "a workplace where relatively small quantities of hazardous chemicals are used on a non-production basis", and in accordance with the WKU Laboratory Safety Policy.

1.3 Scope

The Laboratory Standard applies to all employees engaged in the laboratory use of hazardous chemicals. This Chemical Hygiene Plan describes necessary protection from risks posed by the laboratory use of hazardous chemicals and is limited to laboratory settings. All WKU laboratories must comply with the requirements detailed in this document. This plan does not specifically address protection needed against radiological, biological, or other hazards (i.e. electrical, laser, mechanical, etc.), and defers to other policies and committees to oversee those safety topics and concerns.

The Radiation Safety Officer & Committee's radiation guidelines apply to all departments, laboratories, and persons at WKU that receive, possess, use, transport, or dispose of radioactive material and/or equipment.

The Laser Safety Program is designed to ensure that no laser radiation in excess of the maximum permissible exposure limit reaches the human eye or skin and encompasses all laser users at WKU.

WKU activities, both research and educational, involving recombinant DNA, culturing of microorganisms, agents infectious to plants, humans, and animals, human gene therapy, cultures of tissues, organs, and cells of human origin, and Select Agents as defined by U.S. federal agencies are governed by WKU's Institutional Biosafety Committee (IBC).

Similarly, the Institutional Animal Care and Use Committee (IACUC) oversees all research, research training, experimentation, biological testing, and related activities involving live, vertebrate animals supported by the Public Health Service (PHS) and conducted at WKU, or at another institution as a consequence of the sub-granting or subcontracting of a PHS-conducted or supported activity by this institution.

2. DEFINITIONS

The following definitions are adapted from the Laboratory Standard:

Chemical Hygiene Plan (CHP) - A written program developed by WKU, which sets forth procedures, equipment, personal protective equipment and work practices that protect laboratory workers from health hazards presented by hazardous materials used in the workplace.

Hazardous chemical - A chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees.

Laboratory - A workplace where relatively small quantities of hazardous chemicals are used on a non-production basis.

Laboratory Supervisors – Any faculty or staff employee responsible for supervising laboratory personnel and/or overseeing laboratory operations. Laboratory Supervisors include Faculty, Principal Investigators, Laboratory Managers, and Laboratory Coordinators.

Laboratory Workers - Any individual employed in a laboratory workplace who may be exposed to hazardous chemicals in the course of his or her assignments. An example of a Laboratory Worker is a WKU teaching assistant, research assistant, or a faculty member instructing an academic lab. OSHA does not consider students in an academic laboratory to be workers. However, instructors are expected to ensure that students in academic laboratory classes adhere to the principles of this plan. Also included, are visiting professors that might be working in a laboratory. Thus, Laboratory Supervisors must ensure that these groups that are in their laboratories are adequately instructed in safe laboratory procedures.

3. AUTHORITY, ROLES, AND RESPONSIBILITIES

Western Kentucky University supports the use of chemicals and other potentially hazardous materials for the purposes of education and research. WKU is committed to ensuring the safety and longevity of its students, employees, and visitors in addition to complying with all regulatory requirements that impact its facilities and operations relating to environment, health and safety. WKU administration, faculty, staff, and students are asked to support this goal in all university activities. If there is any question about where the Laboratory Standard applies and whom it covers, the Environmental Health and Safety Department (EHS) will make the determination upon request.

The following outlines specific responsibilities associated with laboratory safety and this Chemical Hygiene Plan. All parties identified in this plan must cooperate to ensure that academic and research activities are conducted safely to protect workers, students, the community and the environment.

3.1 University Environmental Health and Safety

WKU Environmental Health and Safety (EHS) is an administrative unit, under the Chief Facilities Officer, which has responsibility for the development and implementation of all WKU programs concerning safety and environmental quality. Environmental Health and Safety developed the Laboratory Safety and Chemical Hygiene Plan and will work jointly with key stakeholders to oversee its implementation. That oversight is accomplished through EHS staff providing a range of safety services, trainings, consultations, and laboratory audits.

Specific responsibilities include:

- Provide technical assistance to laboratory supervisors and workers concerning appropriate storage, handling and disposal of hazardous chemicals.
- Provide general laboratory safety training upon request.
- Conduct exposure assessments and keep a record of laboratory safety inspections.
- Provide technical assistance concerning personal protective equipment and laboratory safety equipment.
- Remain current on rules and regulations concerning chemicals used on campus.
- Provide guidelines for and keep record of routine laboratory safety inspections of in-house equipment.

3.2 Chemical Hygiene Officer

The Chemical Hygiene Officer (CHO) is to provide technical guidance for the continued implementation of the Chemical Hygiene Plan. The Chemical Hygiene Officer for WKU is the Laboratory Safety Officer.

Specific responsibilities include:

- Develop and maintain a Laboratory Safety Plan and distribute plan to all affected departments.
- Provide a yearly review of the Laboratory Safety and Chemical Hygiene plan.
- Monitor application and use of chemicals in the laboratories.

- Monitor adherence to the requirements of the Chemical Hygiene Plan.
- Conduct laboratory inspections to maintain that the objectives of this plan are being met.
- Assist in administration of Laboratory Safety Policy.

3.3 Deans, Directors, and Department Heads or Chairs of Academic and Administrative Units

Specific responsibilities include:

- Approve and institute policy on laboratory safety.
- Collaborate with faculty and staff to adopt the Chemical Hygiene Plan to include lab-specific procedures and to develop strategies to implement the Plan.
- Develop applicable laboratory safety training programs.
- Establish and oversee committees as needed to address specific laboratory concerns.
- Appropriate required funding for health and safety-related improvements to facilities and equipment.
- Review laboratory safety inspections and help ensure deficiencies have been corrected.
- Alert EHS of any suspected safety concerns or issues during routine walkthroughs of laboratories.

3.4 Laboratory Supervisors: Faculty, Principal Investigators, Laboratory Managers, Laboratory Coordinators

Each laboratory supervisor is responsible for the safety of individuals working within his or her laboratory. In the context of research laboratories, this responsibility is placed on Principal Investigators. Faculty members must work to adapt and implement the provisions of this Chemical Hygiene Plan. This includes ensuring that each individual working within the laboratory is provided with appropriate training on safety and regulatory requirements prior to initiating any laboratory experimentation and procedures; that required safety equipment and personal protective devices are maintained, and used; that specific standard operating procedures incorporating safety considerations are developed and observed; that their laboratory personnel receive the appropriate procedure-specific instruction and are proficient at performing those procedures; that laboratory personnel follow the procedures, and that prompt action is taken to correct any unsafe acts or conditions which have been observed or reported.

Specific responsibilities include:

- Review and understand Safety Data Sheets (SDS) on materials used by laboratory workers under their direct supervision; and apprise employees/laboratory workers as new SDS become available.
- Inform and train employees and laboratory workers concerning chemical safety as required by this Plan. Retain training records and all documentation. See Appendix I – Laboratory Safety Training Documentation.

- Follow any specific laboratory standard operating procedures issued or written by department heads or chairs or directors.
- Implement and enforce rules and standards of this plan concerning health and safety for laboratories; and, where necessary, restrict access to the laboratory.
- Ensure compliance of laboratory workers with this Plan.
- Ensure that all containers of hazardous materials are labeled with the chemical name or trade name (in English, in addition to any other applicable languages).
- Enforce the proper use of appropriate personal protective equipment and relevant health and safety reference materials (SDS).
- Remain cognizant of chemicals stored and used in laboratories and their associated hazards.
- Develop an annual inventory of chemicals present in the laboratory.
- Conduct internal inspections of applicable laboratories for health and safety concerns and maintain an inspection log of inspection findings. Report egregious health and safety issues to EHS that may require additional follow up, training, or consultation.
- Properly discard expired or unused chemicals, complying with hazardous waste disposal requirements.
- Participate in laboratory decommissioning when necessary.

3.5 Laboratory Workers & University Students

In addition to implementing applicable requirements of the Laboratory Safety and Chemical Hygiene Plan, laboratory workers and university students must be familiar with and adhere to prudent laboratory safety guidelines developed by their laboratory supervisor, WKU requirements, and other relevant regulatory requirements (e.g. Radiation Safety).

Specific responsibilities include:

- Participate in required training.
- Follow all health and safety standards and rules.
- Report all hazardous conditions to the laboratory supervisor.
- Wear or use prescribed protective equipment.
- Report any suspected job-related injuries or illnesses to the laboratory supervisor and seek treatment immediately.
- Refrain from the operation of any equipment or instrumentation without proper instruction and authorization.
- Remain aware of the hazards of the chemicals in the laboratory and how to handle hazardous chemicals safely.
- Request information and training when unsure how to handle a hazardous chemical or procedure.

4. STANDARD OPERATING PROCEDURES

The Laboratory Standard requires operating procedures relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals.

The following general standard operating procedures (SOP) apply to all laboratories at WKU, in addition to experiment-specific, laboratory-specific developed standard operating procedures (See Appendix II – SOP template):

Awareness: Know the potential hazards of the materials used in the laboratory. Review the SDS and container label prior to using a chemical.

Know the locations of safety equipment such as emergency showers, eye washes, fire extinguishers, fire alarms, first aid kits, spill kits, and emergency phone numbers. See Appendix III – Emergency Phone Number List Door Posting to display in each laboratory.

Authorized Access: The laboratory supervisor must restrict access to laboratories. Children (under age 17) are not allowed in laboratories except as authorized by the laboratory supervisor for an officially sanctioned activity (e.g. class or open house). Pets are also prohibited from the laboratories. (See Service Animal Exception.) Comply with departmental rules and regulations.

Containers: Check the integrity of containers and if damaged or leaking, transfer to an acceptable container or call EHS for assistance. All containers must be labeled (minimally, in English). Observe compatibility; for example, some oxidizers should not be stored in plastic containers. Appendix IV – Chemical Container Compatibility has further compatibility requirements.

Cylinder Handling: Use appropriate handcarts to move cylinders. Cylinders should only be moved with safety valve covers on and secured. Extremely toxic gases (e.g. hydrogen sulfide, chlorine, arsine) should not be moved through regular exit corridors, particularly during business hours. Always consider cylinders as full and handle them with corresponding care. Cylinders must be secured at all times.

Disposal of Waste: It is important to segregate wastes. To request pick-up of hazardous waste, biohazardous waste, or chemicals, use the online request system found on the EHS website (https://www.wku.edu/ehs/forms/waste_pickup_request.php) . Disposal of all laboratory waste must follow the procedures specified by EHS. All containers must be labeled properly, in English, with no abbreviations or shorthand.

Equipment: Only use proper equipment that is in good condition. For example, never use chipped or cracked glassware. Shield pressurized or vacuum apparatus, and safeguard against bumping or overheating.

Food, Drink, Cosmetics: Eating, drinking, and the application of cosmetics (including lip balm) is forbidden in areas where hazardous chemicals are used and must be done only in well-defined, designated non-chemical areas. Do not store food in the same refrigerator with chemicals, biohazards, or radioactive materials. Never eat or drink where hazardous chemicals are being used or stored.

Handling of Hazardous Substances: Handling, use, and storage of hazardous substances should follow applicable SOP for each particular laboratory and align with pertinent safety information.

Horseplay: Horseplay, practical jokes, or other inappropriate and unprofessional behavior in the laboratory setting is forbidden. Avoid distracting or startling any other workers.

Housekeeping: Exits, aisles, electrical controls, and safety equipment must NOT be obstructed in any way with equipment, clutter, furniture, etc. No items must be stored in the corridors. For questions related to the use of corridors or stairwells/ other exits, contact the EHS office.

Service Animals: Service animals are permissible pending hazard assessment and pre-approval for all laboratories that have the potential for biological or chemical exposure.

Smoking: Smoking is prohibited in all WKU buildings, including all laboratories.

Unattended Experiments: Frequently, laboratory operations are carried out continuously or overnight. For experiments involving hazardous operations, it is essential to plan for interruptions in utility services such as electricity, water and inert gas. Operations are to be safe and plans must be made to avoid hazards in case of failure. If necessary, arrangements for routine inspection of the operation are to be made and, in all cases, the laboratory lights should be left on and an appropriate sign posted on the door. Each laboratory should design an SOP regarding unattended experiments.

Working Alone: As a rule, it is not appropriate for personnel to be working with hazardous materials or processes alone. Prior approval and training is required by laboratory supervisor for deviations from this rule.

In addition to adopting those outlined above and in this Plan, the following SOPs are recommended for each laboratory:

- Equipment operation
- Laboratory shutdown
- Provision for loss of power
- Spill cleanup protocols

5. LABORATORY SAFETY GUIDELINES

5.1 CONTROLLING CHEMICAL EXPOSURE

There are three major routes of entry for a chemical to enter the body: inhalation, absorption, and ingestion. Three types of controls for prevention of these various routes of entry include engineering controls, personal protective equipment, and administrative controls. Detailed below are applicable control methods per each entry route. See Appendix V – Hierarchy of Control Methods as reference for controlling chemical exposure.

Inhalation Hazards

To avoid inhalation exposures, the following controls are suggested:

- Hazard reduction methods such as substituting a less volatile or a less toxic chemical or substituting a liquid or solid chemical for a gaseous one.

- Engineering controls such as ventilation should be used to lessen the chance of exposure. The use of well-functioning local exhaust ventilation such as fume hoods, biological safety cabinets, vented glove boxes, and other local exhaust systems is often required to minimize exposure to hazardous chemicals and powders.
- For extremely toxic chemicals, such as those classified as poison gases by State or Federal agencies (e.g., arsine, phosgene), the use of closed systems, vented gas cabinets, fail-safe scrubbing, detection, or other stricter controls maybe necessary.
- Personal protective equipment, such as dust masks, ventilators, or self-contained breathing apparatus may be used if other controls are insufficient or unavailable. If respirators are to be worn, a laboratory worker should contact EHS. The laboratory standard requires proper training and fitting if respirators are to be worn in accordance with WKU's Respiratory Protection Program.

Skin/Eye Contact Hazards

To reduce the risk of a chemical entering the body via skin and eye contact the following are suggested:

- Engineering controls such as substitution and appropriate ventilation.
- Personal protective equipment such as eye protection, face shields, gloves, appropriate shoes, lab aprons, lab coats, and other protective equipment as appropriate to the hazard.
- Safety showers/eye wash equipment is required where corrosive chemicals are used. Such equipment should be prominently labeled, properly maintained, and not obstructed.
- Care should be taken to not contact or accidentally contaminate surfaces or substances with hazards that could be handled by un-gloved hands or non-laboratory personnel.

Ingestion Hazards

To avoid exposure to hazardous materials via ingestion the following are suggested:

- Engineering controls, such as isolating the hazardous substance for minimal contact (e.g., use glove box).
- Personal protective equipment such as the wearing of gloves.
- Administrative controls such as restricting mouth pipetting, encouraging good personal hygiene, and designating a well-marked non-chemical area where eating, drinking, and the application of cosmetics is permitted.

Exposure Assessment

When it becomes necessary, whether by the location, quantity, hazards of the particular chemical, or due to the nature of the experiment, Environmental Health and Safety, in conjunction with the laboratory supervisor, may conduct exposure evaluations for any formally or informally reported overexposures to substances regulated by OSHA. Records of exposure evaluations will be kept in the Environmental Health and Safety Department and provided to the department and affected employees and any other appropriate authorities at WKU.

5.2 LABORATORY SAFETY TRAINING

All individuals who work in laboratories who may be exposed to hazardous chemicals must be apprised of the hazards of chemicals present in their work area. It is the responsibility of the laboratory supervisors to ensure that all laboratory workers and students have been properly trained. See Appendix VI – Laboratory Safety Training Checklist for list of minimal training requirements.

Information

Laboratory workers must be informed of the location and availability of the following:

- This Chemical Hygiene Plan.
- Reference materials on chemical safety (including safety data sheets).
- Permissible exposure limits for OSHA regulated substances, or if there is no applicable OSHA standard, the recommended exposure limits or threshold limit value may be provided (contact Environmental Health and Safety).
- Signs and symptoms associated with exposure to the hazardous chemicals found in the lab.

Training

Laboratory worker training must include:

- Review of basic laboratory procedures and any laboratory-specific SOPs.
- Detection methods that may be used to detect the presence or release of a hazardous chemical. (i.e. visual appearance, odor, detector papers, and an understanding of chemical monitoring devices).
- Physical and health hazards of the chemicals.
- Portable fire extinguisher training.
- Hazardous waste training, spill handling, and containment.
- Work practices, personal protective equipment, and emergency procedures to be used to ensure protection from overexposure of the hazardous chemicals with which employees work.
- Emergency evacuation routes and proper response to fire or other emergencies.

5.3 PERSONAL PROTECTIVE EQUIPMENT

Personal protection and personal hygiene are two very necessary aspects of laboratory safety. Wearing appropriate personal protective equipment(PPE) and practicing good personal hygiene as described below will minimize exposures to hazardous chemicals during routine use and in the event of an accident. Basic standards for laboratory attire and PPE are described below:

- **Attire:** Where applicable, wear a lab coat or apron, cover legs and feet (no sandals or open-toed shoes), and confine loose clothing and long hair.
- **Eye Protection:** It is WKU's policy that personnel, including students, staff, and visitors in laboratories, wear appropriate safety eyewear at all times where chemicals are stored or handled. Contact lenses are not recommended in the laboratory: use prescription glasses when possible. Eyewear to include glasses, goggles, or face shields; the determination will be made at

the departmental level as a standard operating procedure (in conjunction with applicable Safety Data Sheets).

- **Gloves:** Gloves are essential when working with hazardous substances. The proper gloves will prevent skin absorption, infection, or burns. All glove materials are not equally effective in protection from chemical hazards. Safety data sheets should be adhered to for proper glove designation. EHS should be contacted for additional support. Potentially contaminated gloves should be removed and not worn in common areas where contacting public surfaces. Gloved hands should never contact door handles, light switches, water fountains, etc.
- **Personal Hygiene:** Hands should be washed frequently throughout the day, before leaving the lab, after contact with any hazardous material, and before eating.
- **Respiratory Protection:** The use of some substances may require the use of respiratory protection (respirators). The use of respirators requires medical evaluation, proper fitting and training by EHS, and adherance to University Respiratory Protection Program.

5.4 MEDICAL CONSULTATION

An opportunity for WKU's laboratory workers (employees) to receive medical consultation must be provided under the following circumstances:

- if an employee develops any symptoms thought to arise from chemical overexposure.
- after an event such as a major spill, leak or explosion which may have resulted in an overexposure.

These suspected or actual exposures requiring medical evaluation can and should be treated as a regular Workers Compensation claim. The injured employee must fill out an Accident – Occupational Injury/Illness Report Form found at www.wku.edu/ehs. The injured employee must go to an appropriate medical facility (e.g. occupational medicine clinic, qualified external physician, etc.) for treatment. Following notification of overexposure, arrangements for an appropriate medical examination must be completed before the exposed individual may return to work.

Any medical examination required by this Plan must be provided without cost to the employee, without loss of pay, and at a reasonable time and place. Records of any medical examination will be maintained at the medical facility providing service and with the affected employee. Excepting emergencies, medical evaluations and treatments resulting from chemical exposure or injuries should be coordinated through workers' compensation.

5.5 LABORATORY SAFETY INSPECTIONS

Laboratory safety inspections are to be conducted at a minimum annually, though an inspection each semester is recommended. In addition, more frequent inspections should be conducted by the laboratory supervisor where hazards or concerns are higher. In addition, the Laboratory Safety Officer will conduct laboratory safety inspections regularly. During inspections, supervisors should take note of excess chemical storage, any broken or unused safety equipment, and any potentially hazardous areas. The findings of laboratory inspections may be used to identify best practices or deficiencies, which may be shared or addressed throughout all laboratories at WKU. See Appendix VII – Sample Laboratory Safety Inspection Checklist.

6. LABORATORY SAFETY SYSTEMS AND EQUIPMENT

Use and availability of various types of safety equipment is critical to practicing safe science. Safety equipment should be present in well-marked, highly visible, and easily accessible locations in or near all laboratories that use hazardous chemicals. It is a priority that safety equipment be well-maintained for optimal function and availability.

6.1 FUME HOODS

Chemical fume hoods, laminar flow cabinets, and biosafety cabinets are all utilized at WKU. The determination of applicability for each will be made by the laboratory supervisor in accordance with OSHA & EPA regulations.

Chemical fume hoods are one of the most important items of equipment used for the protection of workers in the laboratory. A standard fume hood is a chemical and fire-resistant enclosure with a moveable window (sash) at the front to allow the user access to the interior. Chemical fume hoods capture, contain, and expel chemical emissions. They also provide a protective barrier between laboratory personnel and chemicals or chemical processes when used properly.

Laminar flow cabinets are enclosed worktables designed to thwart contamination of biological samples or any particle-sensitive materials. Air is drawn through a HEPA filter and blown in very smooth, laminar flow toward the user. The cabinet is typically stainless steel construction without gaps or joints to avoid spore collection. This type of cabinet is not appropriate for use with hazardous chemicals.

Biosafety cabinets are enclosed, ventilated workbenches for use with pathogenic or biological material based on specified biosafety level that requires that degree of protection. These cabinets protect the laboratory worker and the surrounding environment from the pathogenic material in use.

Utilizing the proper workspace, cabinet, or hood is a frontline defense against hazardous material injury in a laboratory.

Fume Hood Usage Qualification Standards

All active chemical fume hoods at university facilities should have face velocities between 80 and 150 feet per minute with the sash at a "working height" (approximately 18 inches). As a general rule, fume hoods should not be operated with the sash fully open and should have the sash closed when not being used. The department of EHS will oversee a fume hood inspection and certification program for all fume hoods and safety cabinets at WKU.

Repairs

Fume hoods with face velocities below 80 feet per minute must be marked with a sign indicating that the hood may not be used for chemical manipulations. A work order to repair these hoods should be processed as soon as possible. Fume hoods with a face velocity above 150 will be indicated on inspection tag and deemed useable based on application and laboratory supervisor determination.

6.2 Safety Interlocks and Alarms

Safety interlocks and alarms are safeguard methods implemented with laboratory equipment, used to achieve or maintain a safe state for a process, and are required to decrease risk with respect to specific hazardous event. These systems are in place to detect danger (i.e. overheating, stray beam, etc.).

Each laboratory utilizing instrumentation or equipment armed with safety interlocks or alarms should have a procedure in place to verify those devices are active and working.

6.3 Eye Wash & Safety Showers

Eye wash stations are required in areas where hazardous chemicals are used. Eye washes must be easily accessible, unobstructed, and clearly labeled. In the event of chemical contamination of the eyes or face, immediately flush the eyes/face for 15 minutes and seek medical attention. Eye washes should be activated weekly by laboratory personnel to ensure that they are working properly. This testing should be documented by the laboratory.

Safety showers are required in areas where hazardous chemicals are used. Safety showers provide an effective means of initial treatment in the event of chemical contamination of the skin or clothing. The shower area must be readily accessible, clear of obstructions, and clearly labeled. Safety showers are tested annually by EHS to ensure that the proper flow is provided according to the ANSI Standard, Z358.1. In the event of chemical contamination of an individual's body, remove all clothing, immediately flush the body for 15 minutes under the shower and seek medical attention.

6.4 Fire Extinguishers

Laboratory personnel should know the locations of all fire extinguishers in or near the laboratory, the type of fires for which they are appropriate, and be trained on how to operate them correctly. Fire extinguishers in the laboratory should be the appropriate type for the expected fire emergency. Extinguishers are classified according to a particular fire type.

Note: Classification of fires and extinguishers – Class A, ordinary combustibles; Class B, flammable liquids; Class C, electrical fires; Class D, combustible metals. Most laboratories are equipped with Class BC fire extinguishers (CO_2 extinguishers). Some may have combination Class ABC fire extinguishers for flammable liquids, gases, and electrical fires.

Fire extinguishers should be easily accessible, mounted properly on a wall, and unobstructed with three foot clearance.

7. Chemical Hygiene

Hazards associated with various chemicals and gases vary widely. Understanding the hazards associated with a compound and minimizing the quantity used and stored in the laboratory will decrease chance of injury.

7.1 General Principles

Chemical Inventory: Maintain the lowest possible inventory of hazardous chemicals. An accurate record of the chemicals on site is required by the Laboratory Standard. The chemical inventory should detail the type and amount of each substance stored in a laboratory facility. Safety Data Sheets should be available for each substance. Unused or excess chemicals should be properly discarded.

Chemical Spills and Accident Response: As a matter of policy, WKU personnel should handle small spills and releases of known chemical materials in accordance with laboratory safe operating procedures. For emergency situations, instances involving extremely hazardous or reactive materials, or large spills and leaks, evacuate and call 911 (Campus Police) from a safe location. If possible, confine the spill or leak before evacuating the laboratory.

Chemical Storage: Chemicals ideally should be stored by compatibility, not simply by alphabetical arrangement. Segregate acids from bases, and inorganic oxidizing acids from organic acids, flammables, and combustibles. Air/water reactive chemicals must be kept dry; and cyanides should be stored away from acids. All containers must be properly labeled in English.

Volatile toxic substances must be stored in volatile storage cabinets adequate to the purpose. When volatiles must be stored in a cooled atmosphere, explosion-proof refrigerators, or similar specially designed equipment must be used. See Appendix X – Chemical Compatibility Charts as reference regarding chemical compatibility/incompatibility.

Flammable Chemical Storage: Keep flammables away from all ignition sources (i.e. open flames, hot surfaces, direct sunlight, spark sources). Store flammable liquids in approved safety containers or cabinets. The following regulations also pertain to each laboratory.

- Individual glass containers of Class I-A liquids must not exceed 1 pint (500 ml) capacity. Individual glass containers Class 1-B liquids must not exceed 1 quart (1 liter) capacity.
    - Exception: Class I-A and I-B liquids may be stored in factory-shipped glass containers up to 1-gallon or 4-liter capacity if the required liquid purity would be affected by storage in metal containers or if the liquid would cause excessive corrosion of a metal container.
- Class I-A liquids can be stored in metal or plastic containers not larger than 1 gallon (4 liters) capacity, or U.L. listed safety cans not larger than 2 gallons (8 liters) capacity.
- For liquids other than Class I-A liquids, the capacity of the containers regardless of type (i.e., metal, glass, etc.) must not exceed five gallons (18.9 liters) each.
- Quantity Limits Inside Flammable Liquid Storage Cabinets
    - Flammable liquids stored in cabinets meeting applicable requirements must not exceed 30 gallons (113.6 liters) total for Class I-A flammable liquids, per cabinet. In addition, the total volume of all classes of flammable and combustible liquids in any one cabinet must not exceed 100 gallons (378.5 liters).
- Quantity Limits Outside Flammable Liquid Storage Cabinets
    - For each room, no more than a total of 11.35 liters (3 gallons) of flammable or combustible liquids may be outside a flammable liquid storage cabinet (with the exception of materials stored in approved safety cans).

Chemical Handling: The use of poly coated bottles or using bottle carriers for transporting chemicals that are in regular glass containers is encouraged. Close caps securely and avoid storing chemical

containers in hard to reach areas. Pour chemicals carefully, and never add water to concentrated acid. Metal containers and non-conductive containers (e.g., glass or plastic) holding more than five gallons (18.9 liters) must be grounded when transferring flammable liquids.

Chemical Transport: Transport and handling should be done in accordance with state, local, and federal standards as well as in conjunction with a review of applicable safety data sheet sections. Individuals transporting chemicals must be familiar with the material's hazards. Chemicals should be transported in secondary containment. Never transport non-compatible chemicals in the same secondary containment. Transport gas cylinders only with the valve covers screwed on and when securely attached to a compressed gas cart. Transport cryogens only in approved storage vessels. Use appropriate personal protective equipment.

Freight elevators should be used for moving chemicals between floors. If freight elevators are not available, the use of restricted-access passenger elevators is to be utilized. Transport should be done in a fashion that minimizes exposure and risk for spill, fire, or injury.

Gas Cylinder Storage: Gas cylinders must be stored in well-ventilated areas with their protective caps screwed on and the cylinder secured (e.g., strapped or chained in an upright position) to reduce the chance of the cylinder being knocked over. Do not store cylinders near heat or high traffic areas. Do not store flammables and oxidizers together. Do not store empty and full cylinders together. Storage of large quantities of cylinders must be done in an approved gas cylinder storage area. Use only approved gas gauges. For guidance regarding storage and use of flammable gas cylinders, consult EHS.

Labeling: All chemical containers must be labeled. All labels must be legible, minimally in English and include chemical/product name and include information related to relevant hazards, as well as the target organ that may be affected. Chemical formulas and abbreviations alone are not acceptable for the purpose of best communicating hazards to laboratory workers and aiding the emergency managers, medical technicians, and fire/rescue workers that may be required to enter laboratories during emergencies. Labels on incoming containers must not be removed or defaced. Reference Appendix XI – GHS Label Elements and Pictograms for information about incoming chemical labels. Date all peroxidizable chemicals and others that may become unstable over time (e.g. ethers); test and/or dispose of them when appropriate. Waste chemical containers must be clearly marked "Hazardous Waste" indicating specific name of waste chemical and date when full.

7.2 CARCINOGENS, REPRODUCTIVE TOXINS, AND ACUTELY TOXIC CHEMICALS

Provisions for additional employee protection for work with particularly hazardous substances are required. Particularly hazardous substances include "select carcinogens", reproductive toxins and substances that have a high degree of acute toxicity.

a. Carcinogens

"Select carcinogens" are any substances that meet one of the following criteria:

- It is regulated by OSHA as a carcinogen.
- It is listed under the category "known to be carcinogens," in the Annual Report on Carcinogens published by the National Toxicology Program (NTP; latest edition).

- It is listed under Group 1 ("carcinogenic to humans") by the International Agency for Research on Cancer Monographs (IARC; latest edition).
- It is listed in either Group 2A or 2B by IARC or under the category "reasonably anticipated to be carcinogens" by NTP.

The standards that apply to carcinogens as regulated by OSHA can be found at https://www.osha.gov/SLTC/carcinogens/standards.html.

The National Toxicology Program has a website that provides the most recent list of materials known or reasonably anticipated to be carcinogenic. The website also provides a profile for each of the chemicals summarizing the carcinogenicity, properties, uses, and exposure routes for the substance. The website can be accessed at http://ntp.niehs.nih.gov/pubhealth/roc/roc13/index.html .

A list of all the materials for which the International Agency for Research on Cancer (IARC) has issued reports can be found at http://monographs.iarc.fr/ENG/Classification/ClassificationsAlphaOrder.pdf .

This site also indicates the category the material falls under, with Group 1, 2A, and 2B being the chemicals of greatest concern.

b. Reproductive Toxins

Reproductive toxins, according to OSHA, are chemicals that affect the reproductive capabilities including chromosomal damage (mutations) and effects on fetuses (teratogenesis). OSHA Standards relating to reproductive toxins are published at https://www.osha.gov/SLTC/reproductivehazards/standards.html .

c. Highly Toxic Compounds

OSHA defines substances that have a high degree of acute toxicity as substances that are “fatal or cause damage to target organs as a result of a single exposure or exposures of short duration.”

A chemical falling within any of the following categories is considered to be highly toxic:

- A chemical that has a median lethal dose LD50 of 50 milligrams or less per kilogram of body weight when administered orally to albino rats weighing between 200 and 300 grams each.
- A chemical that has a median lethal dose LD50 of 200 milligrams or less per kilogram of body weight when administered by continuous contact for 24 hours (or less if death occurs within 24 hours) with the bare skin of albino rabbits weighing between two and three kilograms each.
- A chemical that has a median lethal concentration LC50 in air of 200 parts per million by volume or less of gas or vapor, or 2 milligrams per liter or less of mist, fume or dust, when administered by continuous inhalation for one hour (or less if death occurs within one hour) to albino rats weighing between 200 and 300 grams each.

Appendix XII – List of Highly Toxic Substances is not an exhaustive list, but may be consulted for quick reference, in conjunction with SDS.

The following provisions must be included for Particularly Hazardous Substances:

1. Establishment of a designated area.
2. Use of containment devices such as fume hoods or glove boxes.
3. Procedures for safe removal of contaminated waste.
4. Decontamination procedures.

7.3 SAFELY HANDLING PARTICULARLY HAZARDOUS SUBSTANCES

In addition to the general safety guidelines mentioned in the first section and throughout the Plan, special precautions are needed when handling genotoxins, reproductive toxins, and chemicals with a high degree of acute toxicity. A minimum set of guidelines that should be followed is listed below. The laboratory supervisor should ensure that these and other precautions designed to minimize risk of exposure to these substances are documented in a laboratory SOP; as well as proper training, and appropriate approvals.

a. Quantities of these chemicals used and stored in the laboratory must be minimized, as should their concentrations in solution or mixtures.

b. Work with genotoxins, reproductive toxins, and acutely toxic chemicals must be performed within a certified functioning fume hood, biological safety cabinet, ventilated glove box, sealed system, or other system designed to minimize exposure to these substances. (The exhaust air from the ventilation systems may require scrubbing, or other treatment, before being released into the atmosphere.) In all cases, work with these types of chemicals must be done in such a manner that the OSHA permissible exposure limits or similar standards are not exceeded.

c. Compressed gas cylinders, which contain acutely toxic chemicals such as arsine, chlorine, and nitrogen dioxide, must be kept in well-ventilated areas.

d. The ventilation efficiency of the designated fume hood, glove box, or gas cabinet, and the operational effectiveness of mechanical and electrical equipment used to contain or manipulate these special substances should be evaluated periodically by the laboratory personnel at intervals determined by the laboratory supervisor. The interval of evaluating systems may vary from weekly to biannually depending upon the frequency of usage, quantities employed and level of hazard.

e. Each laboratory utilizing these substances must designate an area for this purpose and must sign or mark this area with an appropriate hazard warning. The designated area may be an entire laboratory (Bio-Safety Level three or four require that the entire laboratory be designated), an area of the laboratory or a device such as a fume hood or glove box. The designated area should be marked with a "DANGER, specific agent, AUTHORIZED PERSONNEL ONLY" or comparable warning sign.

f. All laboratory workers in an area designated for use with genotoxins, reproductive toxins, and acutely toxic chemicals must be trained about the deleterious effects of these substances as well as signs and symptoms regarding exposure to these substances, whether or not they actually work with the substance themselves. Training

to ensure the safe handling and storage of these substances is required for those who use these materials. This training is the responsibility of the laboratory supervisor and must be done prior to the use of any of these materials.

g. Laboratory workers working with these chemicals must have access to appropriate protective equipment and clothing (available at no expense to the workers) and must be trained on how to properly utilize the safety equipment.

h. Detection equipment may be required in laboratories where chemicals (especially poisonous gases) with a high degree of acute toxicity are utilized. For special disposal information, contact EHS.

i. The designated working area must be thoroughly and appropriately decontaminated and cleaned at regular intervals determined by the laboratory supervisor in concert with another staff or faculty member. The interval may be as short as one day or as long as six months depending upon the frequency of usage and level of hazard.

j. Special precautions to avoid release and exposure to highly toxic chemicals, genotoxins, and reproductive toxins must be utilized. For instance, volatile substances should be kept cool and contained. Gases should have properly functioning valves, check valves, regulators, containment which can withstand pressure buildup, and appropriate piping. Dispersive solids should be kept in closed containers, used in places with minimum air currents, and appropriate contact materials should be used to avoid static charging.

7.4 NANOMATERIALS AND NANOPARTICLES

A nanoparticle is a collection of tens to thousands of atoms approximately 1 to 100 nanometers in diameter. Nanoparticles that are naturally occurring (e.g., volcanic ash, forest fires) or are the incidental byproducts of combustion processes (e.g., welding, diesel engines) are usually physically and chemically heterogeneous and often termed “ultrafine particles.” Engineered nanoparticles are intentionally produced and designed with very specific properties related to shape, size, surface properties, and chemistry. These properties are reflected in aerosols, colloids, or powders. Engineered nanoparticles may be bought via commercial vendors or generated via experimental procedures by researchers in the laboratory. Examples of engineered nanomaterials include carbon bucky-balls or fullerenes; carbon nanotubes; metal oxide nanoparticles (e.g., titanium dioxide); and quantum dots, among many others.

The higher reactivity of many nanoscale materials suggests that they should be treated as potential sources of ignition, accelerants, and fuel that could result in fire or explosion. Easily dispersed dry nanomaterials may pose the greatest health hazard because of the risk of inhalation. Operations involving these nanomaterials deserve more attention and more stringent controls than those where the nanomaterials are embedded in solid or suspended in liquid matrixes.

Nanoparticles and nanomaterials have different reactivities and interactions with biological systems than bulk materials, and understanding and exploiting these differences is an active area of research. Because this is an area of ongoing research, consult trusted sources for the most up to date information available.

As the health effects of exposures to nanomaterials are not fully understood at this time and until more definitive findings are made regarding the potential health risks of handling nanomaterials, researchers

planning to work with nanomaterials must implement a combination of engineering controls, work practices, and personal protective equipment to minimize potential exposures to themselves and others. To minimize laboratory personnel exposure, conduct any work that could generate engineered nanoparticles in an enclosure that operates at a negative pressure differential compared to the laboratory personnel breathing zone. Consideration should be given to all possible routes of exposure to nanomaterials including inhalation, ingestion, injection, and dermal contact (including eye and mucous membranes). Avoid handling nanomaterials in the open air in a free particle state. Whenever possible, handle and store dispersible nanomaterials, whether suspended in liquids or in a dry particle form, in closed (tightly-sealed) containers. Unless cutting or grinding occurs, nanomaterials that are not in a free form (encapsulated in a solid or a nanocomposite) typically will not require engineering controls. If a synthesis is being performed to create nanomaterials, it is not enough to only consider the final material in the risk assessment, but consider the hazardous properties of the precursor materials as well.

8. EMERGENCY PLANNING

Planning and practicing for emergencies is an essential component of laboratory safety. Laboratory workers should have the knowledge necessary to assess their risks - from a small spill or release of a chemical to a small trash can fire - if they have received proper training. The most important aspect of this training is being able to differentiate between an incidental situation and an emergency. Practice in emergency procedures and evacuation drills will provide laboratory workers with the insight they need to make this differentiation.

An incidental release is one that does not cause an imminent health or safety hazard to laboratory workers and does not have to be cleaned up immediately in order to prevent death or serious injury to employees. Laboratory workers should prepare for and handle their own incidental spills or releases.

The following is a list of life threatening situations. If any of these situations occur, the emergency procedures of the following section need to be followed.

- High concentrations of toxic substances.
- Imminent danger to life and health (IDLH) environments.
- An oxygen-deficient atmosphere.
- Condition that poses a fire or explosion hazard.

WKU's Emergency Management Plan contains elaborated information for these and other emergencies and should be referenced for planning and preparedness.

Shelter should never be sought in laboratories containing chemical, biological, or radioactive materials during tornados, earth quakes, or other natural disasters.

Additional training and resources are available through the Environmental, Health, and Safety department regarding fire and emergency preparedness.

8.1 Emergency Procedures for Selected Emergencies

Fires and Other Life Threatening Situations

The four actions below must be taken by whoever discovers a fire or other life threatening situation. Actual emergency conditions may require the procedures to be followed in a different order, depending on the layout of the laboratory, time of day, the number of people present, and the location of the emergency relative to doors and alarm stations or telephones.

In the event that a fire cannot be extinguished quickly and safely, these four steps must be taken:

1. Alert personnel in the immediate vicinity. Tell the nature and extent of the emergency. Give instructions to sound the alarm, close doors, and call for assistance.
2. Summon aid from a safe location. Call 911. Give location and type of emergency.
3. Confine the fire or emergency without endangering yourself. Shut hood sash if possible. Close doors to prevent spread of vapors, gases, or fire.
4. Evacuate the building or hazardous area. Follow posted evacuation procedures. Assemble at designated meeting point.

9. LABORATORY SECURITY MEASURES

Laboratory security has evolved in the past decade, reducing the likelihood of some emergencies and assisting in preparation and response for others. Most security measures are based on the laboratory's vulnerability.

Risks to laboratory security include, but are not limited to:

- Theft or diversion of chemicals, biologicals, and radioactive or proprietary materials, mission-critical or high-value equipment.
- Threats from activist groups.
- Intentional release of, or exposure to, hazardous materials.
- Sabotage or vandalism of chemicals or high-value equipment.
- Loss or release of sensitive information.
- Rogue work or unauthorized laboratory experimentation.

A good laboratory security plan increases overall safety for laboratory personnel and the public, improves emergency preparedness by assisting with preplanning, and lowers the organization's liability by incorporating more rigorous preparation, staffing, training, and command systems and implementing emergency communications protocols, drills, background checks, card access systems, video surveillance, and other measures as appropriate depending on the severity of the risk. The security plan should clearly delineate response to security issues, including the coordination of institution and laboratory personnel with both internal and external responders. In addition, laboratory security should include inventory controls and accountability for hazardous products.

Individual laboratory security measures on campus will be devised based on risk assessments conducted by the laboratory safety officer, laboratory supervisors, and department heads, chairs, or directors.

Appendix I – Laboratory Safety Training Documentation

Laboratory Safety Training Record

Laboratory Supervisor _____ Department _____

Building/Room _____ Date of Training _____

Description of Training (Training materials attached)

_____

_____

_____

Attendees Names & Signatures

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Appendix II – Standard Operating Procedures Template

Laboratory Standard Operating Procedure Form

Date: _____

SOP Title: _____

Principal Investigator: _____

Room and Building: _____

Laboratory Phone Number: _____

Section 1 – Process

Section 2 – Hazardous Chemicals

Section 3 – Potential Hazards

Section 4 – Approvals Required

Section 5 – Designated Area

Section 6 – Special Handling Procedures and Storage Requirements

Section 7 – Personal Protective Equipment

Section 8 – Engineering/Ventilation Controls

Section 9 – Spill and Accident Procedures

Section 10 – Waste Disposal

Section 11 – Decontamination

Section 12 – Process Steps

Process Steps	Safety Measures

Appendix III – Emergency Phone Number List Door Posting

Building/Room Number	
Laboratory Contacts	
Principal Investigator/Laboratory Coordinator	
Alternate Laboratory Supervisor	
Departmental Laboratory Safety Contact	
Laboratory Safety Officer, Sarah Grant	270-745-3597
Facilities Management	270-745-3253
Emergency Contacts	
All Emergencies	911
WKU Police	270-745-2548
Kentucky Regional Poison Control Center	800-222-1222

In case of emergency during campus' non-operational hours, holidays, and weekends, contact WKU Police Department.

Personal Protective Equipment Required			
Eye	☑ Goggles	☐ UV Glasses	☐ Other_____
Gloves	☐Nitrile Disposable	☐ Cryogenic	☐ Other_____
☑ Full foot and leg covering required.			
Other			

Disclosed Laboratory Hazards			
Biohazard		Corrosives	
Laser		Compressed Gases	
Explosion		Radioactivity	
Flammability		Other	

No food, drink or smoking permitted in this laboratory.

Appendix IV – Chemical Container Compatibility

It is most advisable to store chemicals in their original containers or to transfer chemicals into similar, smaller, bottles.

Below are some general guidelines to be followed for chemical-container compatibility, in addition to any notations from applicable Safety Data Sheets.

Chemical / Chemical Category	Recommended Container
Mineral Acids	Plastic
Bases	Plastic
Oxidizers	Glass
Organics, including acetic acid	Glass
Flammables	Primarily, Glass or Safety Can; additionally, plastic

Other Chemical-Container Considerations:

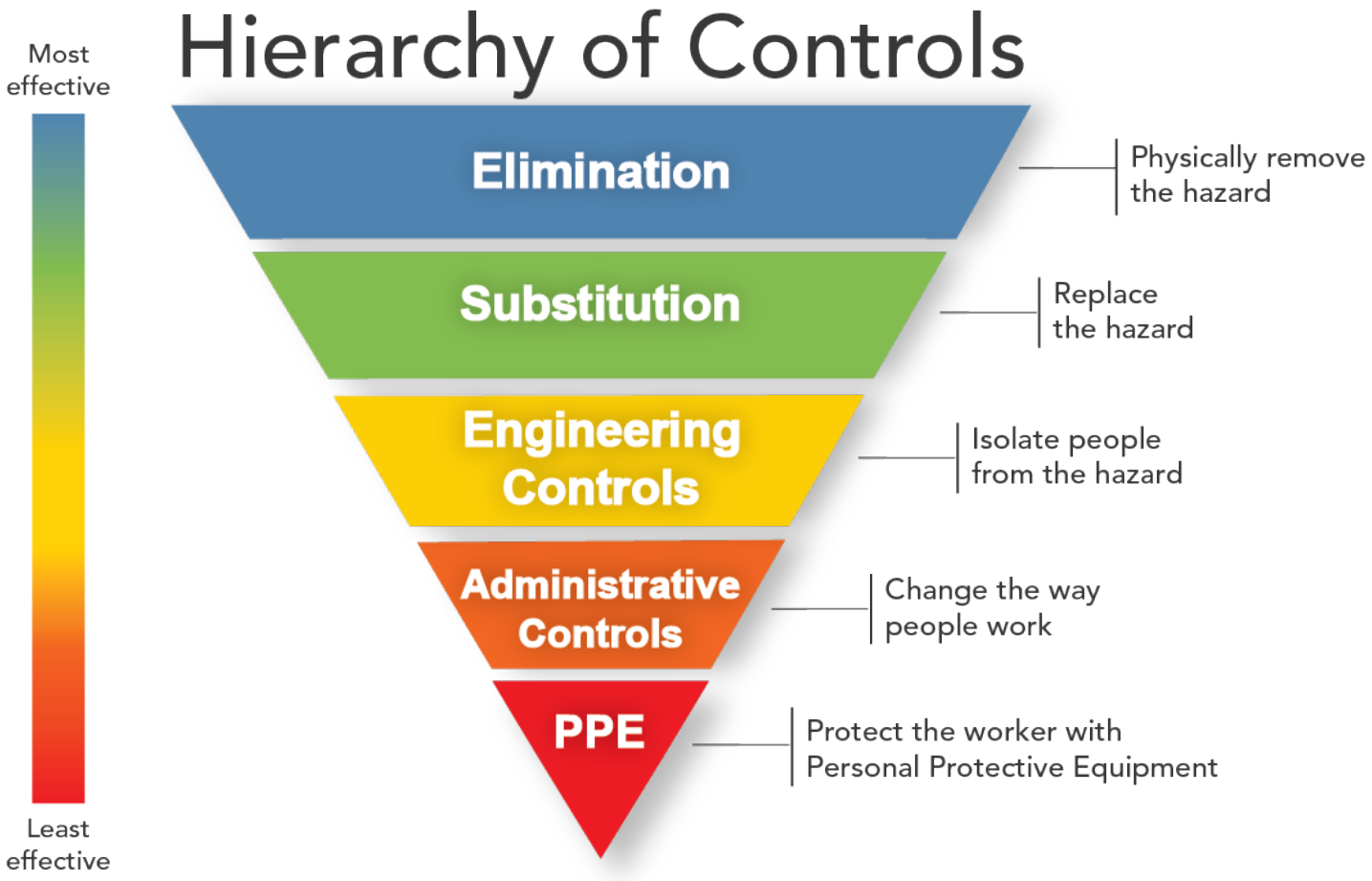
Nitric Acid: reacts with organics (including, acetic acid) to produce heat and gas. If product containers for organics are used to collect nitric acid, be sure to rinse thoroughly to avoid potential over-pressurization and subsequent burst of the container.

Organic Peroxides: highly reactive with organics and organic material, such as wood. May also react with metals.

Hydrofluoric Acid: Dissolves glass containers

Appendix V – Hierarchy of Control Methods

Below, an image detailing the Hierarchy of Control Methods from most effective to least effective. Laboratories should employ the most effective methods possible to control chemical exposure.



Appendix VI – Laboratory Safety Training Checklist

Laboratory Safety Training Checklist

Laboratory Supervisor/ Trainer	
Laboratory Worker	
Date of Training	
Laboratory Location	

✓	N/A	Training Topic
		Location, use, necessity and maintenance of personal protective equipment
		Location and proper use of fire extinguishers, first aid kit, eye wash, and safety shower
		Emergency plan, phone numbers, and evacuation procedures
		Reporting spills, injuries, and near-misses to laboratory coordinator/Principal Investigator
		Laboratory-specific standard operating procedures
		Physical and health hazards of chemicals used and stored in laboratory
		Signs and symptoms associated with hazardous chemical exposure
		Location and understanding of Safety Data Sheets (SDS)
		Detection methods for presence of hazardous chemical release
		All biohazards present in laboratory and appropriate handling and containment
		Identifying an exposure to biohazards and health risks associated with working with applicable biological materials
		Use and location of proper disinfectants, decontaminants, and autoclave
		Biological and chemical spill handling and containment
		Laboratory-unique equipment and applicable standard operating procedures
		Hazardous and regulated waste handling, storage, and disposal
		OSHA applicable programs and policies (i.e. Bloodborne Pathogens, Respiratory Protection, HAZCOM, etc.)
		Applicable CITI Training modules : Responsible Conduct of Research, Basic Introduction to Biosafety, etc.
		Radiation, Laser, and X-Ray safety training

Worker Signature: _____Trainer Signature: _____

Appendix VII – Sample Laboratory Safety Inspection Checklist

Laboratory Supervisor/Principal Investigator: _____

Location: _____

Laboratory Safety Checklist	Yes	No	N/A	COMMENTS
Training and Documentation				
Up-to-date inventory maintained for all hazardous materials?				
Chemical Safety Data Sheets (SDS) maintained and readily available at all times employees are present?				
Employees know the location of SDS and related reference material?				
Employees received institutional safety training (typical provided by Environmental Health and Safety office) and supplemental laboratory-specific safety training for the hazards present in the laboratory?				
Employees familiar with physical and health hazards of chemicals in work area?				
Employees able to describe how to detect the presence or release of hazardous materials?				
Employees know how to protect themselves and others from effects of hazardous materials?				
Spill and Emergency Planning				
Employees familiar with the fire safety and building evacuation procedures including evacuation routes, nearest fire exits, fire alarm pull stations, and fire extinguishers?				
Emergency procedures and phone numbers clearly posted?				
First aid materials readily available?				
Spill cleanup materials available and laboratory staff familiar with their use?				
Safety shower and eye wash accessible and unobstructed ?				
Safety shower tested and documented within past year?				
Eye wash tested, flushed, & documented at least monthly?				
Fire alarm pull stations, strobes, speakers, and fire extinguishers unobstructed and visible?				
Exits clearly marked and unobstructed?				
Personal Protection Clothing, Equipment and Engineering Controls				
Personnel wear appropriate shoes and clothing to protect feet and legs?				
Long hair confined? Jewelry, lanyards and other loose articles are confined or removed?				
Lab coats of appropriate material worn? (as required)				
Appropriate gloves available and worn?				
Goggles, face shields, are of appropriate type and worn?				
Respirators available and used in the laboratory? If yes…				
Respirator training, fit test and medical evaluation completed for employees?				
Respirators cleaned, stored, and inspected regularly?				
Chemical hood available? If yes…				
Chemical hood free of clutter?				
Chemical hood inspected within last 12 months and capable of drawing at least 80 LFPM (or more if appropriate)?				
Biological Safety Cabinet available? If yes…				
Biological Safety Cabinet free of clutter and surfaces decontaminated?				

Laboratory Safety Checklist	Yes	No	N/A	COMMENTS
Biological Safety Cabinet certified within last 12 months?				
Mechanical pipetting used, no mouth suction?				
Chemical Safety				
Are chemicals used in this area? If yes…				
Appropriate labels are found on all hazardous chemical containers?				
Containers are in good condition (e.g., labels intact, metal cans free of rust) and closed when not in use?				
Containers properly segregated by hazard class (e.g., flammables away from oxidizers, acids separate from bases, incompatible acids separated)?				
Flammable liquids stored in OSHA/NFPA approved cabinets and safety containers?				
Flammables liquids requiring refrigeration stored in either explosion proof or flammable resistant refrigerators and freezers (i.e., no regular refrigerators)?				
Ignition sources avoided when using/storing flammables?				
Corrosives stored in acid cabinets or other appropriate cabinets?				
Peroxide formers properly labeled?				
Large containers (4L or greater) stored near the floor?				
Bottle carriers or carts utilized when transporting hazardous chemicals between work areas?				
Designated area properly cleaned and decontaminated?				
Biological Safety				
Are biological materials used in this area? If yes…				
Biological materials are not stored in hallways in unlocked freezers or refrigerators.				
Biohazard signs are posted in labs handling infectious materials (BSL2 and higher).				
Disinfectants are on hand for sanitizing bench tops and treating spills.				
Biological safety cabinet(s) was certified within the last 12 months.				
Ionizing and Non-Ionizing Radiation Safety				
Are radioactive materials used in this area? If yes…				
Pure beta emitters (e.g., P-32, P-33, S-35, C-14)?				
Gamma and x-ray emitters (e.g., I-125, I-131, Cr-51, Na-22)?				
Volatile, gaseous radioisotopes (e.g., I125) or aerosol/dust generating laboratory operations (e.g., vacuum flasks)?				
Sealed sources?				
Irradiators?				
X-ray generating equipment (Electron Microscope, X-ray diffraction, Diagnostic X-ray, Computed Tomography)?				
Is the proper shielding available for the types of radioisotopes being used?				
Are appropriate meters available for radioactive material used and are meter(s) calibrated?				
Are radiation workers provided personal monitoring when required?				
Are all appropriate signs posted? (Radiation Labels, Notice to Employees and Emergency Procedures)				

Laboratory Safety Checklist	Yes	No	N/A	COMMENTS
Are all spaces and items which store, handle or use radioactive materials properly labeled with "Radioactive Material", "Radiation Area" or other applicable hazard warning labels?				
Are radioactive materials secured/locked against unauthorized access from nonauthorized users?				
Is non-ionizing radiation used in the area? If yes…				
Laser – Class 1, 1M?				
Laser – Class 2, 2M?				
Laser – Class 3R?				
Laser – Class 3B?				
Laser – Class 4?				
Personal protective equipment (e.g., eye protection) or shielding available specific to the Class lasers used?				
Laser hazard warning signage posted?				
Compressed and Cryogenic Gas Safety				
Are compressed gas cylinders used in this area? If yes…				
Cylinders stored upright and properly secured at all times?				
Caps properly secured when cylinders are not in use?				
Regulators always used, proper regulators used for type gas, pressure bled when not in use?				
Cylinders in good condition and clearly marked?				
Flammables stored separately from oxidizers, toxics in secure area, etc.?				
Cylinders of flammable gases stored in ventilated enclosures?				
Cylinders moved on cylinder trucks with regulators removed and caps secured?				
Cylinders of toxic gases (e.g., NFPA health hazard 3 or 4 and 2) stored and used in continuously ventilated enclosures?				
Cryogenic gas cylinder pressure relief values in proper working condition?				
Oxygen monitor available in areas with increased likelihood of oxygen deficient atmospheres?				
Equipment and Physical Hazards Safety				
Are equipment safety signs posted and in good condition?				
Are all guards and shields in place and secured?				
Are safe work practices (long hair tied back, no loose clothing, etc.) being adhered to by all equipment users?				
Is equipment in good repair with evidence of proper maintenance?				
Are electrical cords in good condition, out of travel paths, and free of any cracks or breaks in insulation?				
Is proper PPE available and being used by equipment operators?				
Is a tagging system in place to prevent use of damaged equipment?				
Is access to the equipment restricted?				
Have all users been trained to operate this equipment?				
Are any additional or new hazards present at or around the equipment?				
General Laboratory Safety				
Smoking, eating, and drinking prohibited in lab?				

Laboratory Safety Checklist	Yes	No	N/A	COMMENTS
Laboratory is maintained secure; door is locked when no one is in lab?				
Appropriate warning signs posted near laboratory entrance?				
Unobstructed aisles maintained throughout?				
Laboratory benches and work areas free of clutter?				
Shelves and cabinets in good condition?				
Shelves have seismic restraints, e.g., lips or wires?				
Shelves and cabinets secured to walls?				
Storage above eye level minimized and items restrained from falling?				
Refrigerators and freezers clearly labeled "Not for Storage of Food for Human Consumption" or equivalent?				
No storage of food or drink in refrigerators, unless dedicated for such and clearly labeled?				
Waste Management				
Wastes are not discarded via trash or drain disposal unless specifically approved by the appropriate institutional authority (e.g., Environmental Health and Safety)?				
Is hazardous chemical waste generated in this area? If yes…				
Chemical inventory management/ordering system in place and checked before ordering new chemicals?				
Waste containers tightly closed unless actively adding or removing waste?				
Satellite Accumulation Area (SAA) is located at or near where waste is generated?				
Maximum SAA storage capacity not exceeded (55-gallons per hazardous waste stream)?				
Waste containers are in good condition (not leaking, rusted, bulging or damaged)?				
Each container is marked with the words “Hazardous Waste”?				
Each container is marked with full chemical names identifying the contents stored inside (no abbreviations or formulas)?				
Waste containers are kept closed unless adding waste?				
Waste containers storing liquid hazardous waste at or near sinks and drains are stored within secondary containment?				
Secondary containment is in good condition (e.g., free of cracks, gaps and impervious to leaks)?				
Is sharps waste (e.g., needles, syringes, scalpel blades, or other instruments that has the potential to cut, puncture, or abrade skin) generated in this area? If yes…				
Sharps wastes are immediately discarded into proper puncture resistant containers?				
Sharps containers are readily available and managed appropriately (e.g., not overfilled)?				
Is biological waste generated in this area? If yes…				
Biological waste liquids decontaminated (if applicable) prior to drain disposal?				
Biological waste solids discarded as regulated and autoclaved or disinfected as appropriate?				
Is radioactive waste generated in this area? If yes…				
Is mixed waste (e.g., scintillation vials and any other radioactive and hazardous chemical waste mixture) generated in this area?				
Are the radioactive waste containers properly labeled?				

Appendix VIII – Safe Work Practices for Laboratory Fume Hoods

A chemical fume hood cannot provide complete safety against all events that may occur in the hood, especially for toxic airborne contaminants with an exposure limit in the low part per billion range. For ordinary exposures, however, a properly designed hood in a properly ventilated room can provide adequate protection. Nevertheless, certain work practices are necessary in order for the hood to perform efficiently. The following work practices are required; more stringent practices may be necessary in some circumstances.

1. All operations that may generate air contaminants at levels above the exposure limit must be conducted inside a hood.
2. Keep all apparatus at least 6 inches back from the face of the hood.
3. Do not put your head in the fume hood
4. Do not use the hood as a waste disposal mechanism.
5. Excessive storage of chemicals or any apparatus in the hood will impair the performance of the chemical fume hood. Store flammable chemicals in an approved flammable storage safety cabinet. Store corrosive chemicals in a corrosive storage cabinet.
6. Be sure that the switch is in the "on" position whenever the hood is in use and test hood often for air flow. (An easy test is to utilize a Kimwipe to check for air flow).
7. Using hazardous solids (powders) in hood may not be appropriate.
8. Keep the slots in the hood baffle free of obstruction by apparatus or containers.
9. Minimize foot traffic past the face of the hood.
10. Keep laboratory doors and windows closed.
11. Do not remove hood sash or panels except when necessary for apparatus set-up; replace sash or panels before operating.
12. Do not place electrical receptacles or other spark sources inside the hood when flammable liquids or gases are present. No permanent electrical receptacles are permitted in the hood.
13. Use an appropriate barricade if there is a chance of explosion or eruption.
14. If hood sash is supposed to be partially closed for operation, the hood should be so labeled and the appropriate closure point clearly indicated.
15. Where perchloric acid is heated above ambient temperature, vapors may condense within the exhaust system to form explosive perchlorates. In such instances, specially designed fume hood exhaust systems must be utilized. These systems will have dedicated exhausts and a water washdown system, and may be used for perchloric acid digestions only. ***NOTE: The use of perchloric acid is prohibited unless the hood has been designed for its specific use and manipulation.***
16. All fume hoods should have spill protection lips (at the front of hood and for cup sinks located in the hood).

Any questions or requests for assistance in evaluation of fume hoods may be directed to EHS and the Chemical Hygiene Officer.

Appendix IX – Sample Weekly Eye Wash Activation Records

Laboratory Eye Wash Activation Record

Building _____ Room _____ Equipment _____

Date	Activation Signature/Initial	Notes

Appendix X – Chemical Compatibility Charts

#	Group Name	Chemical Examples	Incompatible Groups
1	Inorganic Acids	Hydrochloric acid Hydrofluoric acid Hydrogen chloride Nitric acid Sulfuric acid Phosphoric acid	2, 3, 4, 5, 6, 7, 8, 10, 13, 14, 16, 17, 18, 19, 21, 22, 23
2	Organic Acids	Acetic acid Butyric acid Formic acid Propionic acid	1, 3, 4, 7, 14, 16, 17, 18, 19, 22
3	Caustics	Sodium hydroxide Ammonium hydroxide solution	1, 2, 6, 7, 8, 13, 14, 15, 16, 17, 18, 20, 23
4	Amines and Alknaolamines	Aminoethylethanolamine Aniline Diethanolamine Diethylamine Dimethylamine Ethylenediamine 2-Methyl-5-ethylpyridine Monoethanolamine Pyridine Triethanolamine Triethylamine Triethylenetetramine	1, 2, 5, 7, 8, 13, 14, 15, 16, 17, 18, 23
5	Halogenated Compounds	Allyl chloride Carbon tetrachloride Chlorobenzene Chloroform Methylene chloride Monochlorodifluoromethane 1,2,4-Trichlorobenzene 1,1,1-Trichloroethane Trichloroethylene Trichlorofluoromethane	1, 3, 4, 11, 14, 17

#	Group Name	Chemical Examples	Incompatible Groups
6	Alcohols, Glycols, Glycol Ether	1,4-Butanediol Butanol (iso, n, sec, tert) Diethylene glycol Ethyl alcohol Ethyl butanol Ethylene glycol Furfuryl alcohol Isoamyl alcohol Methyl alcohol Propylene glycol	1, 7, 14, 16, 20, 23
7	Aldehydes Acetaldehyde	Acrolein Butyraldehyde Crotonaldehyde Formaldehyde Furfural Paraformaldehyde Propionaldehyde	1, 2, 3, 4, 6, 8, 15, 16, 17, 19, 20, 23
8	Ketones	Acetone Acetophenone Diisobutyl ketone Methyl ethyl ketone	1, 3, 4, 7, 19, 20
9	Saturated Hydrocarbons	Butane Cyclohexane Ethane Heptane Paraffins Paraffin wax Pentane Petroleum ether	20
10	Aromatic Hydrocarbons	Benzene Cumene Ethyl benzene Naphthalene Toluene Xylene	1, 20
11	Olefins	Butylene 1-Decene 1-Dodecene Ethylene Turpentine	1, 5, 20

#	Group Name	Chemical Examples	Incompatible Groups
12	Petroleum Oils	Gasoline Mineral Oil	20
13	Esters	Amyl acetate Butyl acetates Castor Oil Dimethyl sulfate Ethyl acetate	1, 3, 4, 19, 20
14	Monomers Polymerizable Esters	Acrylic acid Acrylonitrile Butadiene Acrylates	1, 2, 3, 4, 5, 6, 15, 16, 19, 20, 21, 23
15	Phenols	Carbolic acid Cresote Cresols phenol	3, 4, 7, 14, 16, 19, 20
16	Alkylene Oxides	Ethylene oxide Propylene oxide	1, 2, 3, 4, 6, 7, 14, 15, 17, 18, 19, 23
17	Cyanohydrins	Acetone cyanohydrin Ethylene cyanohydrin	1, 2, 3, 4, 5, 7, 16, 19, 23
18	Nitriles	Acetonitrile Adiponitrile	1, 2, 3, 4, 16, 23
19	Ammonia	Ammonium hydroxide Ammonium gas	1, 2, 7, 8, 13, 14, 15, 16, 17, 20, 23
20	Halogens	Chlorine Fluorine	3, 6, 7, 8, 9, 10 ,11, 12, 13, 14, 15, 19, 21, 22
21	Ethers	Diethyl ether Tetrahydrofuran (THF)	1, 14, 20
22	Phosphorus	Elemental phosphorus	1, 2, 3, 20
23	Acid Anhydrides	Acetic acid anhydride Propionic anhydride	1, 3, 4, 6, 7, 14, 16, 17, 18, 19

Chemical	Is Incompatibile With
Acetic Acid	Chromic Acid, nitric acid, hydroxyl-containing compounds, ethylene glycol, perchloric acid, peroxides, and permanganates
Acetone	Concentrated sulfuric and nitric acid mixtures or chloroform and bases
Acetylene	Copper tubing, halides, silver, mercury and their compounds
Alkali Metals	Aluminum, calcium, lithium, magnesium, potassium, and sodium with water or chlorinated hydrocarbon, carbon dioxide, halogens
Ammonia, Anhydrous	Mercury, halogens, calcium hypochlorite, hydrogen fluoride
Aniline	Nitric acid and hydrogen peroxide
Azides	Acids
Bromine	Ammonia, acetylene, butadiene, butane hydrogen, sodium carbide, turpentine
Chlorates	Ammonium salts, acids, metal powders, sulfur, finely divided organic and combustible materials
Chromic Acid	Acetic acid, alcohol, camphor, flammable liquids, glycerol, naphthalene
Chlorine	Ammonia, acetylene, butadiene, benzene and other petroleum fractions, hydrogen, sodium carbides, powdered metals
Copper Salts	Acetylene, hydrogen peroxide
Cyanides	Acids
Ehtylenediamine	Greater than 3 percent with methylene chloride (explosive)
Flammable Liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, halogens, nitric acid, sodium peroxide
Hydrocarbons	Generally: fluorine, chlorine, bromine, chromic acid, sodium peroxide
Hydrogen Peroxide	Copper, chromium, iron, most metals and their salts, flammable fluids, aniline and nitromethane
Hydrogen Sulfide	Nitric acid and oxidizing gases
Iodine	Acetylene, ammonia
Mercury	Acetylene, hydrogen
Methylene Chloride	Greater than 3 percent ethylenediamine (explosive)
Nitric Acid	Acetic, chromic, and hydrochloric acids, aniline, carbon, hydrogen sulfide, flammable fluids, or gases which are readily nitrated
Oxygen	Oils, grease, hydrogen; flammable liquids, solids, and gases
Oxalic Acid	Mercury, silver
Perchloric Acid	Acetic anhydride, alcohol, bismuth & its alloys, organic materials (i.e. wood paper, grease, and oils)
Phosphorus	Air, alkalis, oxygen, reducing agents
Phosphorus Pentoxide	Water
Potassium Permanganate	Glycerine, ethylene glycol, benzaldehyde, sulfuric acid
Sodium	Carbon dioxide, carbon tetrachloride, water
Sodium Peroxide	Any oxidizable substances; acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerol, ethylene glycol, ethyl acetate, methanol, furfural, glycerine
Sulfuric Acid	Potassium chlorate, potassium perchlorate, potassium permanganate

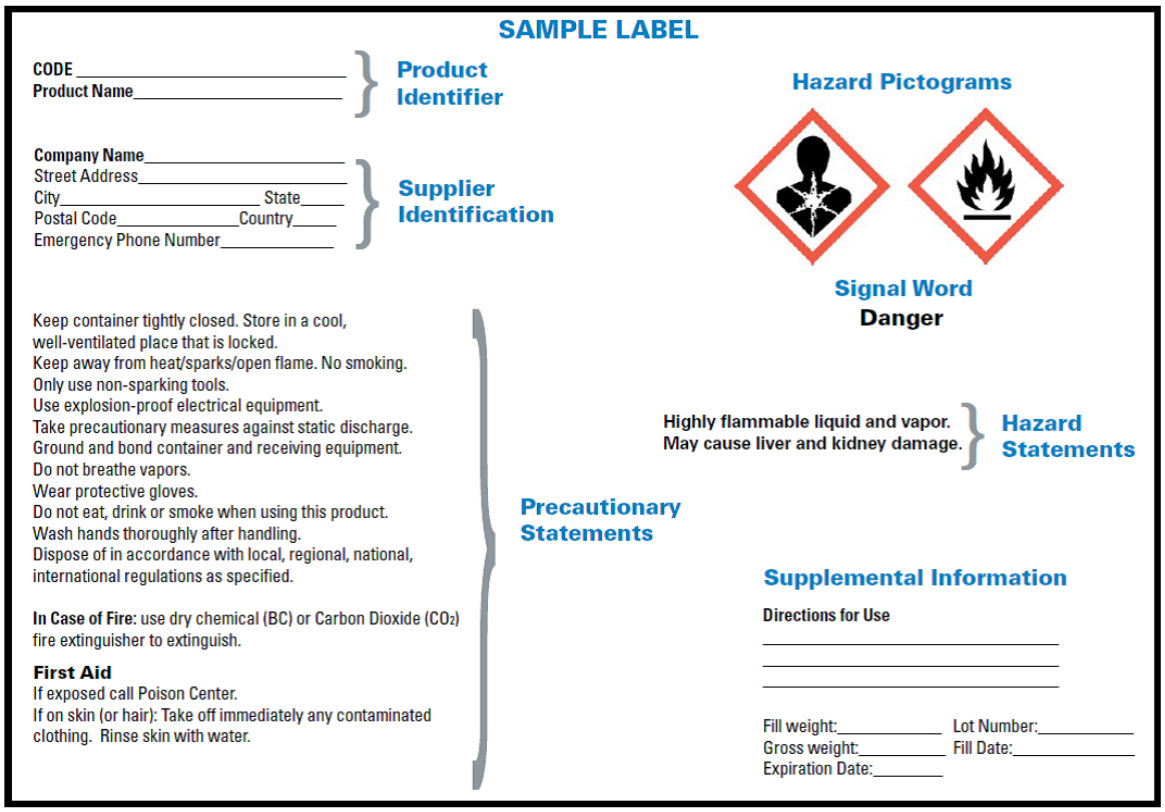
Appendix XI – GHS Label Elements and Pictograms

Labels on chemical containers must comply with the Globally Harmonized System (GHS) for labeling of chemicals. The requirements have been adopted as part of the Hazardous Communication Standard, 29 CFR 1910.1200, that makes provisions to communicate hazards more effectively.

The components of a GHS-compliant label are listed below.

1. Product Identifier: Chemical name, code number, or batch number determined by the supplier.
2. Signal Word: used to indicate the relative level of severity of hazard. "Danger" for severe hazards or "Warning" for less severe hazards.
3. Pictogram: Symbols used to depict the hazard categories associated with the chemical. See pictograms below for all symbols and definitions.
4. Hazard Statement(s): A description of the hazard(s) of the chemical including the degree of hazard. For example: "Causes damage to kidneys through prolonged or repeated exposure when absorbed through the skin." Hazard Statements are specific to the hazard classification categories, and chemical users should always see the same statement for the same hazards.
5. Precautionary Statement(s): A phrase that describes recommended measures that should be taken to minimize or prevent adverse effects resulting from exposure to a hazardous chemical or improper storage or handling.
6. Name, address and phone number of the chemical manufacturer, distributor, or importer.

An example of a chemical label containing all GHS elements is below.



Pictograms

Health Hazard  • Carcinogen • Mutagenicity • Reproductive Toxicity • Respiratory Sensitizer • Target Organ Toxicity • Aspiration Toxicity	**Flame**  • Flammables • Pyrophorics • Self-Heating • Emits Flammable Gas • Self-Reactives • Organic Peroxides	**Exclamation Mark**  • Irritant (skin and eye) • Skin Sensitizer • Acute Toxicity (harmful) • Narcotic Effects • Respiratory Tract Irritant • Hazardous to Ozone Layer (Non-Mandatory)
Gas Cylinder  • Gases Under Pressure	**Corrosion**  • Skin Corrosion/ Burns • Eye Damage • Corrosive to Metals	**Exploding Bomb**  • Explosives • Self-Reactives • Organic Peroxides
Flame Over Circle  • Oxidizers	**Environment** **(Non-Mandatory)**  • Aquatic Toxicity	**Skull and Crossbones**  • Acute Toxicity (fatal or toxic)

Appendix XII – List of Highly Toxic Substances

COMPOUND	CAS #
ACETONE CYANOHYDRIN (DOT)	75-86-5
ACROLEIN, INHIBITED (DOT)	107-02-8
ACTIDIONE	66-81-9
ACTINOMYCIN D	50-76-0
AFLATOXINS	1402-68-2
ALDRIN (DOT)	309-00-2
ALLYL BROMIDE (DOT)	106-95-6
ALLYL ISOTHIOCYANATE	57-06-7
ALLYLIDENE DIACETATE	869-29-4
ALUMINUM PHOSPHIDE (DOT)	20859-73-8
AMINO PYRIDINE, 2-	504-29-0
AMINOPTERIN	54-62-6
AMINOPYRIDINE, 4-	504-24-5
ANTU (NAPHTHYLTHIOUREA, ALPHA-)	86-88-4
ARSENIC ACID, SODIUM SALT (SODIUM ARSENATE)	7631-89-2
ARSENIC ACID, SOLUTION	7778-39-4
ARSENIC IODIDE	7784-45-4
ARSENIC PENTASULFIDE	1303-34-0
ARSENIC PENTOXIDE (DOT)	1303-28-2
ARSENIC TRICHLORIDE	7784-34-1
ARSENIC TRIOXIDE	1327-53-3
ARSENIC TRISULFIDE	1303-33-9
ARSENIOUS ACID (ARSENIC TRIOXIDE, SOLID)	1327-53-3
ARSENIOUS OXIDE (ARSENIC TRIOXIDE, SOLID)	1327-53-3
ARSINE	7784-42-1
AZINPHOS-METHYL	86-50-0
AZIRIDINE	151-56-4
BAY 25141	115-90-2
BENZEDRINE	300-62-9
BENZENETHIOL (PHENYL MERCAPTAN) (DOT)	108-98-5
BIDRIN	141-66-2

COMPOUND	CAS #
BORON TRIFLUORIDE	7637-07-2
BUSULFAN	55-98-1
BUTANEDIOL DIMETHYLSULFONATE, 1,4-	55-98-1
BUTYL-4,6-DINITROPHENOL, 2-SEC-	88-85-7
CALCIUM ARSENATE, SOLID	7778-44-1
CALCIUM CYANIDE	592-01-8
CARBON OXYFLUORIDE	353-50-4
CARBONYL CHLORIDE	75-44-5
CARBONYL FLUORIDE	353-50-4
CARBONYL SULFIDE	463-58-1
CHLORINATED DIPHENYL OXIDE	31242-93-0
CHLORINE (DOT)	7782-50-5
CHLORINE PENTAFLUORIDE	13637-63-3
CHLORINE TRIFLUORIDE	7790-91-2
CISPLATIN	15663-27-1
CYANOGEN	460-19-5
CYANOGEN CHLORIDE	506-77-4
CYCLOHEXIMIDE	66-81-9
CYCLOPHOSPHAMIDE	50-18-0
DASANIT	115-90-2
DAUNOMYCIN	20830-81-3
DDVP (DICHLORVOS)	62-73-7
DEMETON, MIXED ISOMERS	8065-48-3
DICHLORO-N-METHYLDIETHYLAMINE, 2,2'-	51-75-2
DICHLORVOS	62-73-7
DICROTOPHOS	141-66-2
DIELDRIN (DOT)	60-57-1
DIETHYL S-[2-(ETHYLTHIO) ETHYL] PHOSPHORODITHIOATE, O-	298-04-4
DIETHYLHYDRAZINE, 1,2-	1615-80-1
DIISOPROPLY FLUOROPHOSPHATE	55-91-4
DIMETHYL MERCURY	593-74-8
DINITRO-O-CRESOL, 4,6-	534-52-1
DINITROPHENOL, 2, 4-	51-28-5

COMPOUND	CAS #
DINOSEB	88-85-7
DIOXATHION	78-34-2
DISULFOTON	298-04-4
DNBP	88-85-7
ENDOSULFAN	115-29-7
ENDRIN	72-20-8
EPN	2104-64-5
ETHION	563-12-2
ETHYLENEIMINE (DOT)	151-56-4
FENAMIPHOS	22224-92-6
FENSULFOTHION	115-90-2
FLUOROACETIC ACID, SODIUM SALT	62-74-8
FONOFOS	944-22-9
GLYCOLONITRILE	107-16-4
GUTHION	86-50-0
HEPTACHLOR	76-44-8
HEPTACHLOR EPOXIDE	1024-57-3
HYDROCYANIC ACID, LIQUIFIED	74-90-8
HYDROGEN CHLORIDE GAS	7647-01-0
HYDROGEN CYANIDE	74-90-8
HYDROGEN FLUORIDE GAS	7664-39-3
HYDROXY-3(3-OXO-1-PHENYLBUTYL)-2H-1-BENZOPYRAN-2-ONE	81-81-2
IRON PENTACARBONYL	13463-40-6
LANNATE	16752-77-5
MELPHALAN	148-82-3
MERCURIC CHLORIDE	7439-97-6
METHYL CYCLOPENTADIENYL MANGANESE TRICARBONYL, 2-	12108-13-3
METHYL HYDRAZINE	60-34-4
METHYL IODIDE	74-88-4
METHYL MERCURY	593-74-8
METHYL PARATHION, LIQUID	298-00-0
METHYL VINYL KETONE, INHIBITED (DOT)	78-94-4
METHYL-BIS(2-CHLOROETHYL) AMINE (NITROGEN MUSTARD), N-	51-75-2

COMPOUND	CAS #
METHYL-N-NITROSO-METHANAMINE,N-	62-75-9
METHYLAZIRIDINE, 2- (PROPYLENEIMINE, INHIBITED)	75-55-8
METHYLHYDRAZINE (DOT)	60-34-4
METHYLPROPYL)-4,6-DINITRO-PHENOL,2-(1-	88-85-7
MEVINPHOS	7786-34-7
MITOMYCIN C	50-07-7
MONOCROTOPHOS	6923-22-4
MYLERAN	55-98-1
NAPHTHYLTHIOUREA, ALPHA-	86-88-4
NITROGEN MUSTARD	51-75-2
NITROSODIMETHYLAMINE, N-	62-75-9
PARAQUAT, RESPIRABLE FRACTION	2074-50-2
PERFLUOROISOBUTYLENE	382-21-8
PHENYL MERCAPTAN (DOT)	108-98-5
PHENYLPHOSPHINE	638-21-1
PHORATE	298-02-2
PHOSDRIN (MEVINPHOS)	7786-34-7
PHOSGENE	75-44-5
PHOSHONOTHIOIC ACID, O-ETHYL O-(PNITROPHENYL)ESTER	2104-64-5
PHOSPHINE	7803-51-2
PHOSPHORUS PENTAFLUORIDE	7641-19-0
POTASSIUM CYANIDE, SOLID (DOT)	151-50-8
PREMERGE	88-85-7
PROPANENITRILE	107-12-0
PROPIONITRILE	107-12-0
PROPYLENEIMINE, INHIBITED (DOT)	75-55-8
SODIUM AZIDE	26628-22-8
SODIUM CYANIDE, SOLID (DOT)	143-33-9
STRYCHNINE, SOLID (DOT)	57-24-9
SULFOTEP	3689-24-5
SYSTOX	8065-48-3
TETRACHLORODIBENZO-P-DIOXIN, 2,3,7,8- (TCDD)	1746-01-6
TETRAETHYL DITHIOPYROPHOSPHATE (TEDP)	3689-24-5

COMPOUND	CAS #
TETRAETHYL LEAD, LIQUID	78-00-2
TETRAETHYLPYROPHOSPHATE, LIQUID	107-49-3
THIODAN (ENDOSULFAN)	115-29-7
THIOPHENOL (PHENYL MERCAPTAN) (DOT)	108-98-5
TRIETHYLENETHIOPHORAMIDE, N,N',N''-	52-24-4
TRIMETHYLENETRINITRAMINE	121-82-4
URACIL MUSTARD	66-75-1
VANADIUM PENTOXIDE	1314-62-1
VAPATONE (TETRAETHYLPYROPHOSPHATE, LIQUID)	107-49-3
WARFARIN	81-81-2

Appendix XIII – Laboratory Safety Contacts

Title	Name	Office Phone
Director of Environmental, Health, and Safety	Dr. David Oliver	270-745-4181
Laboratory Safety Officer Chemical Hygiene Officer	Sarah Grant	270-745-3597
Environmental Compliance Coordinator	Larry Page	270-745-6366
University Fire Marshal	Bob Austin	270-745-2931
Health and Safety Specialist	Cynthia George	270-745-2163

For list of additional contacts, please call the Environmental, Health and Safety Department at 270-745-2395.